Hand Holding

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Allen, J. P., Porter, M., McFarland, C., McElhaney, K. B., & Marsh, P. (2007). The relation of attachment security to adolescents' paternal and peer relationships, depression, and externalizing behavior. *Child Development*, *78*(4), 1222-1239.

The relation of attachment security to multiple domains of psychosocial functioning was examined in a community sample of 167 early adolescents. Security of attachment organization, assessed using the Adult Attachment Interview, was linked to success in establishing autonomy while maintaining a sense of relatedness both with fathers and with peers, even after accounting for predictions from qualities of the mother-teen relationship. Growth curve analyses revealed links of insecurity to increasing patterns of externalizing behavior and higher and stable patterns of depressive symptoms across adolescence. Implications for a developing theory of the connections of the attachment system to multiple domains of functioning in adolescence are discussed.

Aron, A., Fraley, B. (1999). Relationship Closeness as Including Other in the Self: Cognitive Underpinnings and Measures. *Social Cognition*, *17*(2), 140-160.

Previous research has identified nonobvious, cognitive indexes of including other in the self (self-other overlap) that differentiate close from nonclose relationships. These indexes include a reaction time measure and a measure focusing on attributional perspective. This study demonstrated for the first time that these cognitive indices differentiated among romantic relationships of varying degrees of closeness, suggesting that self-other overlap is not an either-or phenomenon. Further, the degree of self-other overlap was associated with subjective feelings of closeness, but little if at all with amount and diversity of interaction, suggesting that cognitive self-other overlap is not a direct product of behavioral interaction. Finally, these indexes predicted relationship maintenance and other variables over 3 months and correlated with self-reports of love, suggesting a broad linkage of cognitive self-other overlap to other aspects of relational experience. Read More: https://guilfordjournals.com/doi/10.1521/soco.1999.17.2.140

Beckes, L., & Coan, J. A. (2011). Social Baseline Theory: The Role of Social Proximity in Emotion and Economy of Action. *Social and Personality Psychology Compass, 5*, 976-988.

Social proximity and interaction attenuate cardiovascular arousal, facilitate the development of nonanxious temperament, inhibit the release of stress hormones, reduce threat-related neural activation, and generally promote health and longevity. Conversely, social subordination, rejection and isolation are powerful sources of stress and compromised health. Drawing

on the biological principle of economy of action, perception/action links, and the brain's propensity to act as a Bayesian predictor, Social Baseline Theory (SBT) proposes that the primary ecology to which human beings are adapted is one that is rich with other humans. Moreover, SBT suggests that the presence of other people helps individuals to conserve important and often metabolically costly somatic and neural resources through the social regulation of emotion.

Beckes, L., & Coan, J. A. (2015). The distress-relief dynamic in attachment bonding. In Zayas, V., & Hazan, C., ed. *Bases of Adult Attachment: From Brain to Mind to Behavior*. New York, NY: Springer Press. pp. 11-33.

Beckes, L., Coan, J. A., & Hasselmo, K. (2013). Familiarity promotes the blurring of self and other in the neural representation of threat. *Social Cognitive and Affective Neuroscience, 8*(6), 670-677.

Neurobiological investigations of empathy often support an embodied simulation account. Using functional magnetic resonance imaging (fMRI), we monitored statistical associations between brain activations indicating self-focused threat to those indicating threats to a familiar friend or an unfamiliar stranger. Results in regions such as the anterior insula, putamen and supramarginal gyrus indicate that self-focused threat activations are robustly correlated with friend-focused threat activations but not stranger-focused threat activations. These results suggest that one of the defining features of human social bonding may be increasing levels of overlap between neural representations of self and other. This article presents a novel and important methodological approach to fMRI empathy studies, which informs how differences in brain activation can be detected in such studies and how covariate approaches can provide novel and important information regarding the brain and empathy.

Coan, J. A., Kasle, S., Jackson, A., Schaefer, H. S., & Davidson, R. J. (2013). Mutuality and the social regulation of neural threat responding. *Attachment & Human Development*, *15*(3), 303-315.

Recent studies have shown that the presence of a caring relational partner can attenuate neural responses to threat. Here we report reanalyzed data from Coan, Schaefer, and Davidson (2006), investigating the role of relational mutuality in the neural response to threat. Mutuality reflects the degree to which couple members show mutual interest in the sharing of internal feelings, thoughts, aspirations, and joys - a vital form of responsiveness in attachment relationships. We predicted that wives who were high (versus low) in perceived mutuality, and who attended the study session with their husbands, would show reduced neural threat reactivity in response to mild electric shocks. We also explored whether this effect would depend on physical contact (hand-holding). As predicted, we

observed that higher mutuality scores corresponded with decreased neural threat responding in the right dorsolateral prefrontal cortex and supplementary motor cortex. These effects were independent of hand-holding condition. These findings suggest that higher perceived mutuality corresponds with decreased self-regulatory effort and attenuated preparatory motor activity in response to threat cues, even in the absence of direct physical contact with social resources.

Coan, J. A., Schaefer, H. S., & Davidson, R. J. (2006). Lending a Hand: Social Regulation of the Neural to Response to Threat. *Psychological Science, 17*(12), 1032-1039.

Social contact promotes enhanced health and well-being, likely as a function of the social regulation of emotional responding in the face of various life stressors. For this functional magnetic resonance imaging (fMRI) study, 16 married women were subjected to the threat of electric shock while holding their husband's hand, the hand of an anonymous male experimenter, or no hand at all. Results indicated a pervasive attenuation of activation in the neural systems supporting emotional and behavioral threat responses when the women held their husband's hand. A more limited attenuation of activation in these systems occurred when they held the hand of a stranger. Most strikingly, the effects of spousal hand-holding on neural threat responses varied as a function of marital quality, with higher marital quality predicting less threat-related neural activation in the right anterior insula, superior frontal gyrus, and hypothalamus during spousal, but not stranger, hand-holding.

Conner, O. L., Siegle, G. J., McFarland, A. M., Silk, J. S., Ladouceur, C. D., Dahl, R. E., Coan, J. A., & Ryan, N. D. Mom-- It Helps When You're Right Here! Attenuation of Neural Stress Markers in Anxious use Youths Whose Caregivers Are Present during fMRI. *PLOS One, 7*(12), e50680.

Close proximity to an attachment figure, such as a caregiver, has been shown to attenuate threat-related activity in limbic regions such as the hypothalamus in healthy individuals. We hypothesized that such features might be similarly attenuated by proximity during a potentially stressful situation in a clinically anxious population of youths. Confirmation of this hypothesis could support the role of attachment figures in the management of anxiety among children and adolescents. Three groups were analyzed: anxious children and adolescents who requested that their caregiver accompany them in the scanner room, anxious children and adolescents without their caregiver in the scanner room and healthy controls (each of N = 10). The groups were matched for age and, among the two anxious groups, for diagnosis (mean age 9.5). The children and adolescents were exposed to physical threat words during an fMRI assessment. Results indicate that activity in the hypothalamus,

ventromedial, and ventrolateral prefrontal cortex were significantly reduced in anxious children and adolescents who requested that their caregiver accompany them in the scanner room compared to those without their caregiver in the scanner room. Mean activity in these regions in anxious children and adolescents with their caregiver in the scanner room was comparable to that of healthy controls. These data suggest links between social contact and neural mechanisms of emotional reactivity; specifically, presence of caregivers moderates the increase in anxiety seen with stressful stimuli. Capitalizing on the ability of anxious youths to manifest low levels of anxiety-like information processing in the presence of a caregiver could help in modeling adaptive function in behavioral treatments.

De Vignemont, F., Singer, T. (2006). The empathic brain: how, when and why? *Trends in Cognitive Science*, *10*(10), 435-441.

Recent imaging results suggest that individuals automatically share the emotions of others when exposed to their emotions. We question the assumption of the automaticity and propose a contextual approach, suggesting several modulatory factors that might influence empathic brain responses. Contextual appraisal could occur early in emotional cue evaluation, which then might or might not lead to an empathic brain response, or not until after an empathic brain response is automatically elicited. We propose two major roles for empathy; its epistemological role is to provide information about the future actions of other people, and important environmental properties. Its social role is to serve as the origin of the motivation for cooperative and prosocial behavior, as well as help for effective social communication.

Goldstein, P., Weissman-Fogel, I., Dumas, G., & Shamay-Tsoory, S. G. (2018). Brain-to-brain coupling during handholding is associated with pain reduction. *PNAS*, published ahead of print.

The mechanisms underlying analgesia related to social touch are not clear. While recent research highlights the role of the empathy of the observer to pain relief in the target, the contribution of social interaction to analgesia is unknown. The current study examines brain-to-brain coupling during pain with interpersonal touch and tests the involvement of interbrain synchrony in pain alleviation. Romantic partners were assigned the roles of target (pain receiver) and observer (pain observer) under pain–no-pain and touch–no-touch conditions concurrent with EEG recording. Brain-to-brain coupling in alpha–mu band (8–12 Hz) was estimated by a three-step multilevel analysis procedure based on running window circular correlation coefficient and post hoc power of the findings was calculated using simulations. Our findings indicate that hand-holding during pain administration increases brain-to-brain coupling in a network that mainly

involves the central regions of the pain target and the right hemisphere of the pain observer. Moreover, brain-to-brain coupling in this network was found to correlate with analgesia magnitude and observer's empathic accuracy. These findings indicate that brain-to-brain coupling may be involved in touch-related analgesia.

Johnson, S. M., Moser, M. B., Beckes, L., Smith, A., Dalgleish, T., Halchuk, R., Hasselmo, K., … Coan, J. A. (2013). Soothing the Threatened Brain: Leveraging Contact Comfort with Emotionally Focused Therapy. *PLOS One*, *9*(8), e105489.

Social relationships are tightly linked to health and well-being. Recent work suggests that social relationships can even serve vital emotion regulation functions by minimizing threat-related neural activity. But relationship distress remains a significant public health problem in North America and elsewhere. A promising approach to helping couples both resolve relationship distress and nurture effective interpersonal functioning is Emotionally Focused Therapy for couples (EFT), a manualized, empirically supported therapy that is strongly focused on repairing adult attachment bonds. We sought to examine a neural index of social emotion regulation as a potential mediator of the effects of EFT. Specifically, we examined the effectiveness of EFT for modifying the social regulation of neural threat responding using an fMRI-based handholding procedure. Results suggest that EFT altered the brain's representation of threat cues in the presence of a romantic partner. EFT-related changes during stranger handholding were also observed, but stranger effects were dependent upon self-reported relationship quality. EFT also appeared to increase threat-related brain activity in regions associated with self-regulation during the no-handholding condition. These findings provide a critical window into the regulatory mechanisms of close relationships in general and EFT in particular.

Karremans, J. C., Heslenfeld, D. J., van Dillen, L. F., & Van Lange, P. A. (2011). Secure attachment partners attenuate neural responses to social exclusion: an fMRI investigation. *International Journal of Psychophysiology*, *81*(1), 44-50.

Research has shown that social exclusion has devastating psychological, physiological, and behavioral consequences. However, little is known about possible ways to shield individuals from the detrimental effects of social exclusion. The present study, in which participants were excluded during a ball-tossing game, examined whether (reminders of) secure attachment relationships could attenuate neurophysiological pain- and stress-related responses to social exclusion. Social exclusion was associated with activation in brain areas implicated in the regulation and experience of social distress, including areas in the lateral and medial

prefrontal cortex, ventral anterior cingulate cortex, and hypothalamus. However, less activation in these areas was found to the extent that participants felt more securely attached to their attachment figure. Moreover, the psychological presence (i.e., salience) of an attachment figure attenuated hypothalamus activation during episodes of social exclusion, thereby providing insight into the neural mechanisms by which attachment relationships may help in coping with social stress.

Maresh, E. L., Beckes, L., & Coan, J. A. (2013). The social regulation of threat-related attentional disengagement in highly anxious individuals. *Frontiers in Human Neuroscience*, *7*, 515.

Social support may normalize stress reactivity among highly anxious individuals, yet little research has examined anxious reactions in social contexts. We examined the role of both state and trait anxiety in the link between social support and the neural response to threat. We employed an fMRI paradigm in which participants faced the threat of electric shock under three conditions: alone, holding a stranger's hand, and holding a friend's hand. We found significant interactions between trait anxiety and threat condition in regions including the hypothalamus, putamen, precentral gyrus, and precuneus. Analyses revealed that highly trait anxious individuals were less active in each of these brain regions while alone in the scanner—a pattern that suggests the attentional disengagement associated with the perception of high intensity threats. These findings support past research suggesting that individuals high in anxiety tend to have elevated neural responses to mild or moderate threats but paradoxically lower responses to high intensity threats, suggesting a curvilinear relationship between anxiety and threat responding. We hypothesized that for highly anxious individuals, shock cues would be perceived as highly threatening while alone in the scanner, possibly due to attentional disengagement, but this perception would be mitigated if they were holding someone's hand. The disengagement seen in highly anxious people under conditions of high perceived threat may thus be alleviated by social proximity. These results suggest a role for social support in regulating emotional responses in anxious individuals, which may aid in treatment outcomes.

Mashek, D. J., Aron, A., & Boncimino, M. (2003). Confusions of self with close others. *Personality and Social Psychology Bulletin*, *29*(3), 382-392.

This article explores the cognitive underpinnings of interpersonal closeness in the theoretical context of "including other in the self" and, specifically, the notion of overlap between cognitive representations of self and close others. In each of three studies, participants first rated different traits for self, close others (e.g., romantic partner, best friend), and less close others (e.g., media personalities), followed by a surprise source

recognition task (who was each trait rated for?). As predicted, in each study, there were more source confusions between traits rated for self and close others (e.g., a trait rated for self recalled as having been rated for the close other) than between self (or close others) and non-close others. Furthermore, several results suggest that the greater confusions between self and close others are due specifically to interpersonal closeness and not to greater familiarity or similarity with close others.

Master, S. L., Eisenberger, N. I., Taylor, S. E., Naliboff, B. D., Shirinyan, D., & Lieberman, M. D. (2009). A picture's worth: partner photographs reduce experimentally induced pain. *Psychological Science*, *20*(11), 1316-1318.

Social support is associated with reduced pain experience across several domains; intriguingly, a handful of experimental studies suggest that this connection may reflect a causal relationship. We examined how the condition compared with one that is more consistent with previous conceptualizations of social support—one in which the participant held her partner's hand. Participants were 28 right-handed women in long-term relationships. Average reaction times to the computer-generated beeps during the seven conditions were submitted to a one-way repeated measures analysis of variance. The findings suggest that bringing loved ones' photographs to painful procedures may be beneficial, particularly if those individuals cannot be there. In fact, because loved ones vary in their ability to provide support, photographs may, in some cases, be more effective than in-person support. In sum, these findings challenge the notion that the beneficial effects of social support come solely from supportive social interactions and suggest that simple reminders of loved ones may be sufficient to engender feelings of support.

Ognibene, T. C., & Collins, N. L. (1998). Adult Attachment Styles, Perceived Social Support and Coping Strategies. *Journal of Social and Personal Relationships*, *15*(3), 323-345.

The relations between adult attachment styles, perceived social support and the use of various coping strategies was examined in a sample of young adults (N = 81). Participants completed measures of adult attachment style, perceived social support from friends and family, and a modified version of the Ways of Coping scale. In addition, participants rated the coping strategies they would most likely use in response to a series of hypothetical vignettes describing social- and achievement-related stressors. Results indicated that secure individuals perceived more available support from friends and family, and sought more social support in response to stress. Although preoccupied adults also sought social support in response to stress, they also tended to use escape/avoidance strategies. Dismissing and fearful individuals were much less likely to seek social support, and were more likely to distance themselves in some

contexts. Finally, regression analyses indicated that the link between secure attachment and support-seeking as a coping strategy was mediated, in part, by the perception that support is available from friends and family.

Reeck, C., Ames, D. R., & Ochsner, K. N. (2016). The Social Regulation of Emotion: An Integrative, Cross-Disciplinary Model. *Trends in Cognitive Sciences*, *20*(1), 47-63.

Research in emotion regulation has largely focused on how people manage their own emotions, but there is a growing recognition that the ways in which we regulate the emotions of others also are important. Drawing on work from diverse disciplines, we propose an integrative model of the psychological and neural processes supporting the social regulation of emotion. This organizing framework, the 'social regulatory cycle', specifies at multiple levels of description the act of regulating another person's emotions as well as the experience of being a target of regulation. The cycle describes the processing stages that lead regulators to attempt to change the emotions of a target person, the impact of regulation on the processes that generate emotions in the target, and the underlying neural systems.

Younger, J., Aron, A., Parke, S., Chatterjee N., & Mackey, S. (2010). Viewing pictures of a romantic partner reduces experimental pain: involvement of neural reward systems. *PLOS One*, *5*(10), e13309.

The early stages of a new romantic relationship are characterized by intense feelings of euphoria, well-being, and preoccupation with the romantic partner. Neuroimaging research has linked those feelings to activation of reward systems in the human brain. The results of those studies may be relevant to pain management in humans, as basic animal research has shown that pharmacologic activation of reward systems can substantially reduce pain. Indeed, viewing pictures of a romantic partner was recently demonstrated to reduce experimental thermal pain. We hypothesized that pain relief evoked by viewing pictures of a romantic partner would be associated with neural activations in reward-processing centers. In this functional magnetic resonance imaging (fMRI) study, we examined fifteen individuals in the first nine months of a new, romantic relationship. Participants completed three tasks under periods of moderate and high thermal pain: 1) viewing pictures of their romantic partner, 2) viewing pictures of an equally attractive and familiar acquaintance, and 3) a word-association distraction task previously demonstrated to reduce pain. The partner and distraction tasks both significantly reduced self-reported pain, although only the partner task was associated with activation of reward systems. Greater analgesia while viewing pictures of a romantic partner was associated with increased activity in several

reward-processing regions, including the caudate head, nucleus accumbens, lateral orbitofrontal cortex, amygdala, and dorsolateral prefrontal cortex--regions not associated with distraction-induced analgesia. The results suggest that the activation of neural reward systems via non-pharmacologic means can reduce the experience of pain.